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Clinical Review Article

A Call for Research on the Validity of the Age-of-Onset Criterion Application in Older Adults Being Evaluated for ADHD: A Review of the Literature in Clinical and Cognitive Psychology

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ABSTRACT

Roughly 3% of adults aged 50 years or older experience significant symptoms of attention-deficit/hyperactivity disorder (ADHD). They are often diagnosed for the first time in later adulthood, because ADHD is a relatively new diagnosis with only recent awareness of later-life cases, and because many symptomatic adults have high early-life functioning due to supportive environmental and social structures. Current Diagnostic and Statistical Manual of Mental Disorders-5 *criteria require evidence of symptom onset prior to age 12, which rests on self-report in older adults for whom ancillary sources are unavailable or unreliable. In this review, we summarize evidence from several bodies of literature which suggest this criterion may be invalid in older adults. The authors hypothesize that demonstrating childhood symptom onset in older adults is not feasible (i.e., no awareness of ADHD prior to 1970; no good current ancillary sources of childhood behaviors), unreliable (i.e., severely flawed retrospective self-report) and unethical (i.e., unreasonable denial of support to people who need it, with demonstrated poor outcomes associated with untreated ADHD in adults). The authors outline additional research that is needed to establish the validity of self-reported childhood symptom onset in this under-studied demographic, including the identification of contextual factors (perhaps unique to late life) that are associated with the emergence of ADHD symptoms in older adulthood; determining the impact of memory biases on recall of childhood symptoms in older adults with ADHD; quantifying self-perception deficits; and investigating the usefulness of executive functioning rating scales to*

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complement diagnostic assessment in older adults. (Am J Geriatr Psychiatry 2020; ■■:■■−■■)

INTRODUCTION

Attention-deficit/hyperactivity disorder (ADHD) is a childhood-onset disorder that persists into adulthood in roughly half of cases[1] with an estimated prevalence of 3%−4% in adults aged 18+.[2,3] Following discoveries that symptom presentation changes with age,[4] the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) provided age-related adjustments to ADHD diagnostic criteria in its most recent iteration,[5] most notably an inclusion of adult symptom descriptors to better define real-world impairments in adults, and the requirement of fewer inattentive and/or hyperactive/impulsive symptoms (five instead of six) when diagnosing patients aged 17+. Crucially, diagnosis in adults still requires demonstration of childhood symptom onset, though the upper-bound age of onset has been increased from 7 to 12 due to findings of many cases of symptom-related impairment occurring later in childhood.[6]

The presence of ADHD in adults aged 50+ (also roughly 3%)[7] has garnered increased consideration over the past decade from clinicians,[8] researchers,[9] and the lay public.[10] Because ADHD is a relatively recent diagnostic category − developed for the first time in 1968 under the DSM-II label "hyperkinetic reaction of childhood" − most affected individuals within this demographic will not have been recognized in childhood and therefore are newly diagnosed upon presentation to primary care practice, psychiatry or memory clinics in later life.[8,11] The fact that practitioners have become aware of later-life ADHD only relatively recently is reflected in diagnostic trends, which indicate that annual ADHD diagnoses in adults have increased significantly faster in the last 10 years than have diagnoses in children.[12]

A later-life diagnosis of ADHD is complicated by the DSM-V requirement to demonstrate symptom onset before age 12, because 1) ADHD symptoms may not be detected in childhood; and 2) documenting childhood-onset in older adults relies heavily on self-report of retrospective symptom recall, which is compromised in ADHD as well as in aging more generally. In this paper we put forth the hypothesis, based on converging evidence from the clinical and cognitive psychological literatures, that it is inappropriate to apply the age-of-onset criterion when diagnosing individuals for the first time in later adulthood. At this time, no studies to our knowledge have directly tested the validity of the age-of-onset criterion in adults aged 50+; as such, we outline possible tests of this hypothesis that should be explored in future work.

ADHD Symptoms May Not Be Detected in Childhood

The purpose of the age-of-onset criterion is presumably to rule out false positive classifications of ADHD in adulthood that may be better explained by another cause. For example, careful documentation of symptom course in adults aged 24−29 years, who appeared to have initial onset in adulthood, revealed that pre-existing or comorbid mental disorders better accounted for nearly all cases.[13] As this suggests that onset in adolescence or adulthood may not reflect "true" ADHD, it follows that establishing childhood onset is necessary to demonstrate diagnostic specificity.

However, criteria for several other neurodevelopmental disorders within the DSM-V[5] acknowledge that symptoms "may not become fully manifest until demands exceed limited capacities" (Social Communication Disorder, p. 48; Autism Spectrum Disorder, p. 50; Specific Learning Disorder, p. 67) or "may be masked by learned strategies" (Autism Spectrum Disorder, p. 50). There is evidence to suggest that ADHD symptoms may similarly remain "hidden" until later in life. Some high-functioning individuals with ADHD, sometimes termed "gifted",[14] are able to maintain function through the use of cognitive or behavioral strategies[15,16] or due to high IQ, which may compensate for other process deficits.[17] There is also a considerable number of children who meet ADHD criteria but do not receive a diagnosis due poor access to healthcare, particularly in families of lower socioeconomic status.[18] Access to healthcare is further compromised by differences in parental help-seeking behaviors across different ethnicities, in

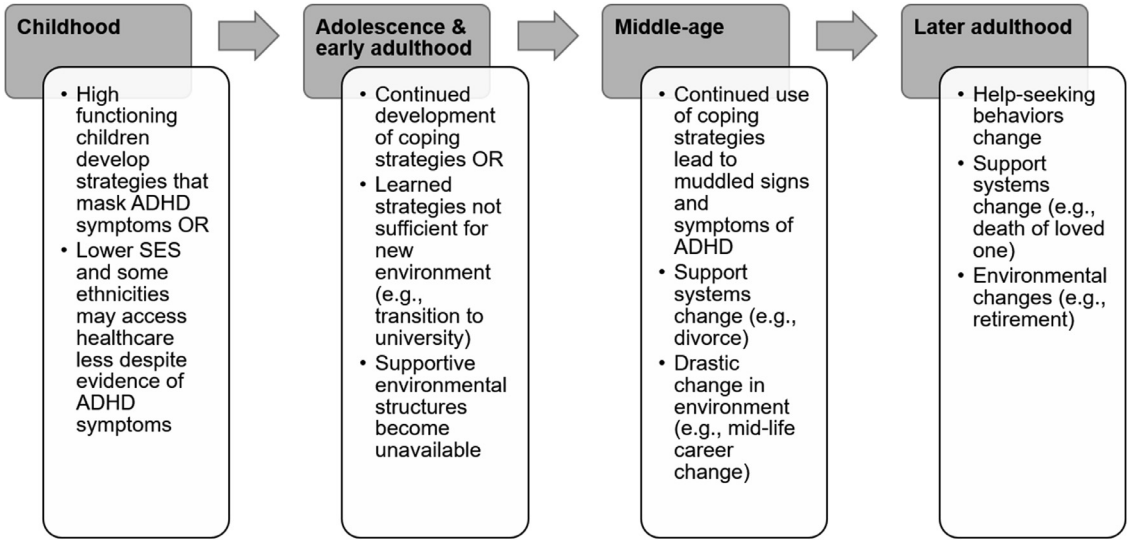
which some ethnicities do not access healthcare when symptoms are evident.[19,20]

Academic or occupational environments may additionally mask symptoms of ADHD if they are sufficiently structured to support the attentional and executive weaknesses at the core of the disorder[21,22] or, conversely, if they are sufficiently flexible to allow individuals to achieve successfully despite their symptoms.[23] In young adults, supportive adults, alternative classrooms, strong intellectual functioning and resilience have been acknowledged as factors that may reduce the likelihood of ADHD being recognized in childhood.[22] Environments that value creative, energetic traits may also allow individuals with ADHD to thrive. Evolutionary perspectives of ADHD have corroborated that traits of hypervigilance, rapid-scanning, hyperactivity and hyper-reflexive responding (i.e., "response-ready" characteristics) are adaptive and advantageous in certain circumstances, and that tailoring the environment to reinforce these traits can be beneficial (e.g., supporting curiosity and experience-seeking), while acknowledging that these same traits can be maladaptive in other contexts.[24] Thus, the manifestation of ADHD symptoms and associated impairment is intimately coupled with external environmental demands.

The Life Transition Model[25] has previously identified sensitive transition periods in the lives of individuals with ADHD which may lead to demand-resource imbalances that can impact the severity and functional impact of ADHD symptoms. Transitions from childhood to adolescence, for instance, may be associated with decreased ADHD medication adherence as patients gain independence from their parents in managing their healthcare regimen; in young and middle adulthood, emerging financial independence and familial/childcare demands are identified as challenges that may functionally impact vulnerable individuals with continual ADHD symptoms since childhood.[25] Although the Life Transition Model does not specifically address demand-resource imbalances in old age, we hypothesize that seniors experience unique contextual factors, such as retirement or death of a spouse, that may contribute to an increase in functional impairment related to exacerbated ADHD symptoms, particularly if one's job or spouse had previously been a significant source of structure and resource management.

Taken together with relatively recent awareness of ADHD as a clinical construct, the convergence of different factors across the lifespan may explain why ADHD is late-identified in some individuals (Fig. 1). Whether ADHD symptoms can go completely

FIGURE 1. Lifespan factors accounting for late-detected ADHD in some individuals.



undetected until older adulthood (i.e., age 50+) has yet to be determined empirically. Based on the research in younger samples reviewed above, we hypothesize that ADHD symptoms may be masked into later life due to effective internal or external structures (e.g., strong cognitive abilities, support of a spouse, and highly controlled work environment) and may become fully manifest following changes to these structures (e.g., age-related cognitive decline, death of the spouse, retirement). A test of this hypothesis could involve, for example, identifying demand-resource shifts that occurred just prior to impairment onset in late-identified ADHD cases, relative to a childhood-onset control group. Longitudinal designs would be particularly valuable in this regard, to identify emerging contextual factors and stressors associated with subsequent exacerbation of ADHD symptoms and impairment.

Childhood Onset May Be Difficult or Impossible to Document

Notwithstanding the late-identified cases described above, decades of rigorous research point strongly to ADHD being a neurodevelopmental disorder that manifests early in life. In establishing onset, the DSM-V acknowledges "difficulties in establishing precise childhood onset retrospectively" (p. 61) and suggests that corroborating evidence be obtained from an ancillary source. In younger adults, this usually refers to parents' recall of their child's symptoms during childhood, or to documented evidence of behavioral difficulties in school records. In older adults, however, corroborating evidence is harder to obtain and interpret. Decades-old school records are likely to be either unavailable, or uninterpretable in light of changes in academic expectations and contexts over time. Furthermore, academic outcomes are not always reflective of ADHD symptomatology,[26] and satisfactory performance should not be used to rule out this diagnosis. Older adults' spouses or partners may provide supportive evidence of symptom chronicity, but informants knowledgeable of childhood-specific issues would be limited to parents (who are likely deceased) or siblings (whose recall for events from several decades prior will be subject to the same memory biases and inefficiencies as that of patients themselves). Practitioners seem to appreciate the lack of reliable ancillary sources when evaluating older clients for ADHD: the vast majority (95%) do not rely on collateral sources in the diagnostic process.[8]

Thus, both in theory (i.e., all available external sources are assumed to be unreliable) and in practice,[8] a formal diagnosis of ADHD in late life depends on self-reported recall of childhood symptoms. This is highly problematic in light of abundant evidence, summarized below, that retrospective recall is unreliable in ADHD and in aging more broadly.

The unreliability of autobiographical memory in aging

Independent of ADHD, everyday memories are known to deteriorate over time and are susceptible to falsehoods.[27,28] Encoding and recalling memories are complex processes, for which memory errors can occur in a variety of ways. When a memory is recalled, it undergoes reconsolidation, and in this process new information may be reconsolidated with it.[29,30] Thus, the overwriting memory may contain false details that compromise its accuracy. Throughout aging, childhood memories are likely to be repeatedly recalled and reconsolidated, making them particularly susceptible to memory errors.

Only 50% of young adults are able to recall the age at which specific childhood memories occurred,[31] and these rates are likely to be further decreased in older adults who rely more heavily on broad, "gist" connections between memories to benefit recall.[32] Reliance on gist increases risk for false memories,[33,34] which has been found to be exacerbated by age.[35] For example, in older adults, broader memory connections increase risk of combining multiple distinct episodic memories, resulting in memory conjunction errors.[36] Similarly, reliance on gist increases the risk of source confusion, in which the source memory is difficult to recall (i.e., poor source monitoring).[37] In fact, older adults are more likely than young adults to display poorer source monitoring, with high confidence, when incorrect details are suggested to them.[35,38] Thus, the literature is highly suggestive of memories deteriorating over time due to overreliance on gist and poor source monitoring and emphasizes the unreliability of autobiographical memory in aging.

An important phenomenon affecting memory specifically within the timeframe referenced by ADHD criteria (i.e., ages 5–12 years) is the reminiscence bump, described as an increase of recalled memories

from the ages of 10−30 in individuals over the age of 40, whereas memories from before age 10 are less well remembered.[39,40] The reminiscence bump is seen across cultures with only minor differences in memory content.[41] The most prominent explanation for this phenomenon involves a cultural life script, in which it is assumed that individuals have a culturally based script that consists of expected events over the lifespan.[39,42,43] However, other explanations for the bump exist such as a neurocognitive perspective, where ages 10−30 are when cognitive functioning is most optimal.[44] Regardless of the explanation for the reminiscence bump, its existence across cultures suggests that older adults show more reliable recall of memories between ages 10 and 30, whereas information recalled prior to age 10 is relatively more flawed. Thus, older adults' memories for ADHD symptoms earlier in life are likely to be particularly unreliable within the timeframe referenced by current criteria.

Even when adults claim to clearly recall earlier life occurrences, their memory may be impacted by "forward telescoping," which refers to the erroneous perception that events occurred more recently than they actually did. Generally speaking, the more distal the event, the higher the likelihood of forward telescoping.[45] The implication for the evaluation of ADHD is that, if asked to estimate the age at which certain symptoms first appeared, older adults are likely to report an onset that is relatively later than in reality.

The unreliability of memory in ADHD

In ADHD specifically, episodic memory performance is generally impaired relative to controls.[46,47] Mechanisms underlying long-term memory impairment in adults with ADHD include inefficient memory encoding,[46,47] which may be due to inattention, as well as ineffective retrieval strategies[48] and poor source monitoring.[49]

These memory impairments directly impact adults' ability to recall ADHD-related details from their own lives. A wealth of evidence suggests that they are limited in their ability to accurately recall the frequency and severity of their childhood symptoms[50−54] and are biased by current symptom severity.[53] In fact, when relying solely on retrospectively self-reported childhood symptoms, correct ADHD classifications only occur in between 55%[51] and 78%[52] of cases, suggesting up to half of cases may go unrecognized if only self-reported symptoms are used. Although this work has exclusively involved young-adult ADHD samples, older adults are likely to experience similar shortcomings in their memory for childhood symptoms (presumably more so, due to the age-related memory declines described earlier).

Future research is needed to empirically determine the extent to which retrospective recall in *older adults with ADHD* is affected by memory biases. Based on the above-reviewed evidence in older adults without ADHD and younger adults with ADHD, we hypothesize that accuracy of older adults' recall of specific ADHD-related events occurring prior to the age of 12 is likely to be severely compromised by an overreliance on gist, poor source monitoring, reminiscence and forward telescoping biases, and current symptom severity bias. Direct tests of this hypothesis could involve comparing temporal gradients of detail- versus gist-based memory performance in older adults with ADHD symptoms (e.g., using an Autobiographical Memory Test[55]). Longitudinal follow-up of adults with ADHD would also be useful to track changes in their symptom estimates against objective baseline measures.

Impaired self-knowledge in ADHD

In addition to the above limitations on memory in ADHD, there is evidence that the disorder is independently associated with poor knowledge of events and details surrounding the self.[47,56] For example, children with ADHD show impaired recall of specific personal events compared to age- and gender-matched healthy controls.[56] They also overestimate their performance on functional activities (e.g., ability to wait, remembering homework, and writing) relative to objective measures or collateral information.[57] These self-perception deficits are also present in young adults with ADHD[58] and are observed when comparing self-reported functioning to objective measures, such as actigraphy and neuroimaging, and to parent reports of current symptoms.[59] Individuals with ADHD, thus, are poor judges of their own experiences and functional abilities.

It is worth adding here that comorbid syndromes such as conduct or learning disorders, which are frequent in ADHD,[60] may impact the accuracy of self-reported symptoms. Many of the common comorbidities in ADHD (e.g., depression) are associated with overgeneralized (i.e., broad and lacking detail) recall

of autobiographical memories.[61] A full review of the impairments associated with psychiatric comorbidities is beyond the scope of this paper, but it should be highlighted that psychiatric comorbidities have been shown to exacerbate existing deficits in episodic memory[62] and self-awareness of symptoms[63] in individuals with ADHD and thus additionally contribute to the potential for inaccuracies in the self-evaluation of symptom onset and severity.

Based on these findings in younger individuals, we hypothesize that self-perception deficits similarly affect older adults with ADHD as well. Direct evidence to test this assumption might come from comparing symptom reports of older participants and a knowledgeable informant (e.g., a spouse), or comparing reported details of recent personal experiences between older adults with ADHD and age-matched healthy controls.

Moving Forward

As stated earlier, the requirement of ADHD symptom onset in childhood is primarily to improve diagnostic specificity by ruling out non-ADHD etiologies that may have developed in later adolescence or adulthood. In seniors, early neurodegenerative diseases (e.g., Alzheimer's or Lewy body dementias) are important non-ADHD syndromes that may confound clinicians through their phenotypic resemblance,[64] and the early-life onset of ADHD is one important feature that sets it apart from these later-onset etiologies. We thus acknowledge that relaxing the childhood-onset aspect of diagnosis will make it challenging to rule out neurodegenerative syndromes as a potential cause of attentional and behavioral difficulties. What information, then, should be collected to establish a sensitive and specific classification of ADHD in older adults for research and clinical purposes?

An approach that may lend clarity and validity to a diagnosis of ADHD in seniors is to document and corroborate chronicity of symptoms (i.e., their longstanding nature, without necessarily focusing specifically on age <12) through self- and other report (e.g., spouse). The European Network Adult ADHD states that this, in conjunction with a "typical" ADHD syndrome presentation, should be sufficient to support a diagnosis of ADHD in adults even when there is no clear recall of symptom onset in childhood,[21] and anecdotally we are aware that this is often the approach taken by experienced clinicians. However, empirical research is needed to establish how many years of chronicity is sufficient to accurately identify true ADHD in seniors. In particular, it will be critical to determine the extent of chronicity that is necessary to best distinguish ADHD-related difficulties from prodromal dementia and normal aging.

Second, establishing a family history of ADHD (e.g., diagnosed first-degree relative) may provide valuable information about the likelihood of ADHD in an older adult, as heritability estimates indicate that clinical ADHD occurs in roughly 50% of parents, and 15% of grandparents, of affected individuals.[65] In other words, older adults' self-reported symptoms are more likely to be due to ADHD if they also report a child or grandchild with ADHD. In our experience, older individuals often become aware they may have ADHD once their younger family members are diagnosed and they recognize themselves in the clinical description. Of course, an individual should not be diagnosed with ADHD simply because ADHD runs in their family, but we suggest it may be an informative element in the broader assessment process that can provide insight into genetic vulnerability, much in the same way as family history is considered valuable in the evaluation of dementia and cancer even though their causes are recognized to be complex and multifactorial.

Lastly, cognitive functioning rating scales (e.g., the Barkley Deficits in Executive Functioning Scale) have been shown to align robustly with ADHD symptoms and have been proposed as a tool to support this diagnosis in younger samples.[66] These scales capture everyday difficulties associated with inattention and impulsivity that are not reflected in formal neuropsychological testing, and thus may provide complementary information for a clinician to gauge the extent to which ADHD features are impacting function. We call for studies investigating the usefulness of these rating scales in older adult samples, and particularly their discriminant validity relative to other late-life disorders affecting cognition.

Of course, the assessment and diagnosis of ADHD at any age should include thorough screening for physical or psychiatric comorbidities that may account for the phenotypic presentation. Because comorbidity is so frequent in ADHD,[60] thoughtful judgement must be applied when determining the extent to which the reported symptoms are best explained by ADHD or by its comorbidities.

CONCLUSION

The DSM-V includes seven broad categories of neurodevelopmental disorders which all must, by definition, manifest early in development, but only ADHD (and one motor disorder, tic disorder) require a specific upper-bound age of symptom onset. Many of the other DSM-V neurodevelopmental disorders also include the acknowledgement that symptoms may become "unmasked" later in life, once environmental demands exceed limited capacities or previous strategies are no longer efficient.[5] Experts addressing ADHD in adults and seniors are already aware of this issue, and some have explicitly admitted that they "often ignore the childhood-onset criterion" for adults (p. 973).[67]

Research examining the validity of self-reported childhood onset of ADHD symptoms in older adults is crucial to determine how these individuals are diagnosed and, consequently, the extent to which they will be able to access care. In many regions, a formal diagnosis is a prerequisite to accessing treatment and certain support services. Denying these options to individuals with clinically impairing symptoms simply because they cannot reliably demonstrate childhood onset is unreasonable and unethical. Adults with such symptoms, when left untreated, fare significantly worse than their same-age peers in terms of self-esteem, social functioning, health, safety and occupational outcomes.[68] Research protocols aiming to study adult ADHD may also be negatively impacted by enrolling only those who fulfill the age-of-onset criterion, because findings will be unrepresentative and lack generalizability to the vast majority of older adults with ADHD symptoms (i.e., those unable to provide reliable evidence of childhood symptoms and/or who maintained high levels of functioning in earlier life due to environmental or social support systems).

The separate cognitive, aging, and ADHD literatures reviewed above lead us to infer that the fallibility of memory and self-knowledge in ADHD, compounded by normal age-related memory declines, result in older adults with ADHD being especially unreliable historians who cannot provide valid accounts of childhood symptom onset. Because ancillary evidence of childhood behaviors is usually unavailable for older adults, we hypothesize that the age-of-onset criterion may not be validly applied to individuals within this demographic. But first, the extent of their deficits in self-report, along with associated implications for diagnosis, must be evaluated empirically. Longitudinal designs would be particularly helpful in this regard, as they would allow direct comparison between objective measures collected at baseline (e.g., symptom severity and personal events) and older adults' subsequent recall of these factors at a later date to estimate the accuracy of retrospective self-evaluation and recall. These designs can also provide direct evidence regarding the onset of new impairment associated with ADHD symptoms in later life (potentially as a result of shifts in the balance between demands and resources), and generate information about the duration of symptom chronicity that results in optimal sensitivity and specificity for distinguishing ADHD from age-related cognitive disorders in older adults. Direct comparisons between older adults with and without clear recall of childhood onset are also needed to clarify whether this variable is associated with clinically meaningful differences (similar to previous work in younger samples[69]). We suspect that results from such studies will point to a need to relax the DSM-V age-of-onset criterion in older adults.

AUTHOR CONTRIBUTIONS

Manu J. Sharma: Literature search; Preparation and final approval of the manuscript; Agreement to be accountable for all aspects of the work.

Sasha Lavoie: Literature search; Preparation and final approval of the manuscript; Agreement to be accountable for all aspects of the work.

Brandy L. Callahan: Design of the work; Literature search; Preparation and final approval of the manuscript; Agreement to be accountable for all aspects of the work.

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References

1. Faraone S V, Asherson P, Banaschewski T, et al: Attention-deficit/hyperactivity disorder. Nat Rev Dis Prim 2015; 1:15020; doi:10.1038/nrdp.2015.20
2. Hesson J, Fowler K: Prevalence and correlates of self-reported ADD/ADHD in a large national sample of Canadian adults. J Atten Disord 2018; 22:191–200;doi:10.1177/1087054715573992
3. Kessler RC, Adler L, Barkley R, et al: The prevalence and correlates of adult ADHD in the United States: results from the national comorbidity survey replication. Am J Psychiatry 2006; 163:716–723;doi:10.1176/ajp.2006.163.4.716
4. Barkley RA, Murphy KR, Fischer M: ADHD in Adults: What the Science Says. New York, NY: The Guilford Press, 2008
5. American Psychological Association: Diagnostic and Statistical Manual of Mental Disorders (DSM-5). fifth edit. Washington, DC: American Psychiatric Publishing, 2013
6. Applegate B, Lahey BB, Hart EL, et al: Validity of the age-of-onset criterion for ADHD: a report from the DSM-IV field trials. J Am Acad Child Adolesc Psychiatry 1997; 36:1211–1221
7. Michielsen M, Semeijn E, Comijs HC, et al: Prevalence of attention-deficit hyperactivity disorder in older adults in the Netherlands. Br J Psychiatry 2012; 201:298–305;doi:10.1192/bjp.bp.111.101196
8. Fischer BL, Gunter-Hunt G, Steinhafel CH, et al: The identification and assessment of late-life ADHD in memory clinics. J Atten Disord 2012; 16:333–338;doi:10.1177/1087054711398886
9. Thorell LB, Holst Y, Chistiansen H, et al: Neuropsychological deficits in adults age 60 and above with attention deficit hyperactivity disorder. Eur Psychiatry 2017; 45:90–96;doi:10.1016/j.eurpsy.2017.06.005
10. Reddy S: An unexpected new diagnosis in older adults: ADHD. Wall Str J 2020 https://www.wsj.com/articles/an-unexpected-new-diagnosis-in-older-adults-adhd-11582558978
11. Faraone S V, Spencer TJ, Montano CB, et al: Attention-deficit/hyperactivity disorder in adults: a survey of current practice in psychiatry and primary care. Arch Intern Med 2004; 164:1221–1226;doi:10.1001/archinte.164.11.1221
12. Chung W, Jiang S, Paksarian D, et al: Trends in the prevalence and incidence of attention-deficit/hyperactivity disorder among adults and children of different racial and ethnic groups. JAMA Netw Open 2019; 2:e1914344;doi:10.1001/jamanetworkopen.2019.14344
13. Sibley MH, Rohde LA, Swanson JM, et al: Late-onset ADHD reconsidered with comprehensive repeated assessments between ages 10 and 25. Am J Psychiatry 2017;doi:10.1176/appi.ajp.2017.17030298, Published online October 20appi.ajp.2017.1
14. Antshel KM: Attention-deficit hyperactivity disorder in the context of a high intellectual quotient/giftedness. Dev Disabil Res Rev 2008; 14:293–299;doi:10.1002/ddrr.34
15. Canela C, Buadze A, Dube A, et al: Skills and compensation strategies in adult ADHD - a qualitative study. PLoS One 2017; 12; doi:10.1371/JOURNAL.PONE.0184964
16. Kysow K, Park J, Johnston C: The use of compensatory strategies in adults with ADHD symptoms. ADHD Atten Deficit Hyperact Disord 2017; 9:73–88;doi:10.1007/s12402-016-0205-6
17. Milioni A, Chaim T, Cavallet M, et al: High IQ may "mask" the diagnosis of ADHD by compensating for deficits in executive functions in treatment-naïve adults with ADHD. J Atten Disord 2017; 21;doi:10.1177/1087054714554933
18. Madsen KB, Ravn MH, Arnfred J, et al: Characteristics of undiagnosed children with parent-reported ADHD behaviour. Eur Child Adolesc Psychiatry 2018; 27:149–158;doi:10.1007/s00787-017-1029-4
19. Bussing R, Koro-Ljungberg ME, Gary F, et al: Exploring help-seeking for ADHD symptoms: a mixed-methods approach. Harv Rev Psychiatry 2005; 13:85–101;doi:10.1080/10673220590956465
20. Bussing R, Zima BT, Gary FA, et al: Barriers to detection, help-seeking, and service use for children with ADHD symptoms. J Behav Health Serv Res 2003; 30:176–189;doi:10.1007/BF02289806
21. Kooij SJ, Bejerot S, Blackwell A, et al: European consensus statement on diagnosis and treatment of adult ADHD: the European network adult ADHD. BMC Psychiatry 2010; 10:67;doi:10.1186/1471-244X-10-67
22. Mitchell JT, Sibley MH, Hinshaw SP, et al: A qualitative analysis of contextual factors relevant to suspected late-onset ADHD. J Atten Disord 2019:1087054719837743;doi:10.1177/1087054719837743, Published online April 1
23. Climie EA: Canadian children's mental health: building capacity in school-based intervention. Interv Sch Clin 2015; 51:122–125; doi:10.1177/1053451215579265
24. Jensen PS, Mrazek D, Knapp PK, et al: Evolution and revolution in child psychiatry: ADHD as a disorder of adaptation. J Am Acad Child Adolesc Psychiatry 1997; 36:1672–1681;doi:10.1097/00004583-199712000-00015
25. Turgay A, Goodman DW, Asherson P, et al: Lifespan persistence of ADHD: the life transition model and its application. J Clin Psychiatry 2012; 73:192–201;doi:10.4088/JCP.10m06628
26. Quinn PO, Madhoo M: A review of attention-deficit/hyperactivity disorder in women and girls: uncovering this hidden diagnosis. Prim Care Companion CNS Disord 2014; 16;doi:10.4088/PCC.13R01596
27. Hyman I, Loftus E: Errors in autobiographical memory. Clin Psychol Rev 1998; 18;doi:10.1016/S0272-7358(98)00041-5
28. Talarico JM, Rubin DC: Flashbulb memories are special after all; in phenomenology, not accuracy. Appl Cogn Psychol 2007; 21:557–578;doi:10.1002/acp.1293
29. Hupbach A, Gomez R, Nadel L: Episodic memory reconsolidation: updating or source confusion? Memory 2009; 17:502–510; doi:10.1080/09658210902882399
30. Hupbach A, Gomez R, Hardt O, et al: Reconsolidation of episodic memories: a subtle reminder triggers integration of new information. Learn Mem 2007; 14:47;doi:10.1101/LM.365707
31. Wells C, Morrison CM, Conway MA: Adult recollections of childhood memories: what details can be recalled? Q J Exp Psychol (Hove) 2014; 67:1249–1261;doi:10.1080/17470218.2013.856451
32. Brainerd C, Reyna V: Gist is the grist: fuzzy-trace theory and the new intuitionism. Dev Rev 1990; 10:3–47;doi:10.1016/0273-2297(90)90003-M
33. Brainerd CJ, Reyna VF: Fuzzy-trace theory and lifespan cognitive development. Dev Rev 2015; 38:89–121 https://doi.org/10.1016/j.dr.2015.07.006
34. Koutstaal W, Schacter DL: Gist-based alse recognition of pictures in older and younger adults. J Mem Lang 1997; 37:555–583 https://doi.org/10.1006/jmla.1997.2529
35. Mitchell KJ, Johnson MK, Mather M: Source monitoring and suggestibility to misinformation: adult age-related differences. Appl Cogn Psychol 2003; 17:107–119;doi:10.1002/acp.857
36. Devitt AL, Tippett L, Schacter DL, et al: Autobiographical memory conjunction errors in younger and older adults: evidence for a role of inhibitory ability. Psychol Aging 2016; 31:927–942; doi:10.1037/pag0000129

37. Ferguson SA, Hashtroudi S, Johnson MK: Age differences in using source-relevant cues. Psychol Aging 1992; 7:443–452;doi:10.1037//0882-7974.7.3.443
38. Dodson CS, Krueger LE: I misremember it well: why older adults are unreliable eyewitnesses. Psychon Bull Rev 2006; 13:770–775;doi:10.3758/bf03193995
39. Munawar K, Kuhn SK, Haque S: Understanding the reminiscence bump: a systematic review. Semkovska M, ed. PLoS One 2018; 13:e0208595;doi:10.1371/journal.pone.0208595
40. Rubin D, Schulkind M: The distribution of autobiographical memories across the lifespan. Mem Cognit 1997; 25;doi:10.3758/BF03211330
41. Conway M, Wang Q, Hanyu K, et al: A cross-cultural investigation of autobiographical memory: on the universality and cultural variation of the reminiscence bump. J Cross Cult Psychol 2005; 36:739–749;doi:10.1177/0022022105280512
42. Glück J, Bluck S: Looking back across the life span: a life story account of the reminiscence bump. Mem Cognit 2007; 35:1928–1939;doi:10.3758/BF03192926
43. Berntsen D, Rubin DC: Cultural life scripts structure recall from autobiographical memory. Mem Cognit 2004; 32:427–442; doi:10.3758/BF03195836
44. Piolino P, Desgranges B, Eustache F: Episodic autobiographical memories over the course of time: cognitive, neuropsychological and neuroimaging findings. Neuropsychologia 2009; 47:2314–2329;doi:10.1016/j.neuropsychologia.2009.01.020
45. Janssen SMJ, Chessa AG, Murre JMJ: Memory for time: how people date events. Mem Cognit 2006; 34:138–147;doi:10.3758/bf03193393
46. Hervey AS, Epstein JN, Curry JF: Neuropsychology of adults with attention-deficit/hyperactivity disorder: a meta-analytic review. Neuropsychology 2004; 18:485–503;doi:10.1037/0894-4105.18.3.485
47. Klein SB, Gangi CE, Lax ML: Memory and self-knowledge in young adults with ADHD. Self Identity 2011; 10:213–230; doi:10.1080/15298861003741604
48. Pollak Y, Kahana-Vax G, Hoofien D: Retrieval processes in adults with ADHD: a RAVLT study. Dev Neuropsychol 2008; 33:62–73; doi:10.1080/87565640701729789
49. Fuermaier ABM, Tucha L, Koerts J, et al: Source discrimination in adults with attention deficit hyperactivity disorder. Brucki S, ed. PLoS One 2013; 8:e65134;doi:10.1371/journal.pone.0065134
50. Alexander L, Liljequist L: Determining the accuracy of self-report versus informant-report using the Conners' Adult ADHD Rating Scale. J Atten Disord 2016; 20:346–352; doi:10.1177/1087054713478652
51. Breda V, Rohde LA, Menezes AMB, et al: Revisiting ADHD age-of-onset in adults: to what extent should we rely on the recall of childhood symptoms. Psychol Med 2020; 50:857–866; doi:10.1017/S003329171900076X
52. Mannuzza S, Klein RG, Klein DF, et al: Accuracy of adult recall of childhood attention deficit hyperactivity disorder. Am J Psychiatry 2002; 159:1882–1888;doi:10.1176/appi.ajp.159.11.1882
53. Miller CJ, Newcorn JH, Halperin JM: Fading memories: retrospective recall inaccuracies in ADHD. J Atten Disord 2010; 14; doi:10.1177/1087054709347189
54. Suhr J, Zimak E, Buelow M, et al: Self-reported childhood attention-deficit/hyperactivity disorder symptoms are not specific to the disorder. Compr Psychiatry 2009; 50:269–275;doi:10.1016/j.comppsych.2008.08.008
55. Griffith JW, Sumner JA, Raes F, et al: Current psychometric and methodological issues in the measurement of overgeneral autobiographical memory. J Behav Ther Exp Psychiatry 2012; 43 (Suppl 1):S21–S31;doi:10.1016/j.jbtep.2011.05.008
56. Fabio RA, Caprì T: Autobiographical memory in ADHD subtypes. J Intellect Dev Disabil 2015; 40:26–36;doi:10.3109/13668250.2014.983057
57. Volz-Sidiropoulou E, Boecker M, Gauggel S: The positive illusory bias in children and adolescents with ADHD: further evidence. J Atten Disord 2016; 20:178–186;doi:10.1177/1087054713489849
58. Knouse LE, Bagwell CL, Barkley RA, et al: Accuracy of self-evaluation in adults with ADHD: evidence from a driving study. J Atten Disord 2005; 8:221–234;doi:10.1177/1087054705280159
59. Du Rietz E, Cheung CHM, McLoughlin G, et al: Self-report of ADHD shows limited agreement with objective markers of persistence and remittance. J Psychiatr Res 2016; 82:91–99; doi:10.1016/j.jpsychires.2016.07.020
60. Katzman MA, Bilkey TS, Chokka PR, et al: Adult ADHD and comorbid disorders: clinical implications of a dimensional approach. BMC Psychiatry 2017; 17:302;doi:10.1186/s12888-017-1463-3
61. Williams JMG, Barnhofer T, Crane C, et al: Autobiographical memory specificity and emotional disorder. Psychol Bull 2007; 133:122–148;doi:10.1037/0033-2909.133.1.122
62. Webster RE, Hall CW, Brown MB, et al: Memory modality differences in children with attention deficit hyperactive disorder with and without learning disabilities. Psychol Sch 1996; 33:193–201;doi:10.1002/(SICI)1520-6807(199607)33:3<193::AID-PITS2>3.0.CO;2-R
63. Hoza B, Vaughn A, Waschbusch DA, et al: Can children with ADHD be motivated to reduce bias in self-reports of competence. J Consult Clin Psychol 2012; 80:245–254;doi:10.1037/a0027299
64. Callahan BL, Bierstone D, Stuss DT, et al: Adult ADHD: risk factor for dementia or phenotypic mimic? Front Aging Neurosci 2017; 9:1–15
65. Starck M, Grünwald J, Schlarb AA: Occurrence of ADHD in parents of ADHD children in a clinical sample. Neuropsychiatr Dis Treat 2016; 12:581–588;doi:10.2147/NDT.S100238
66. Barkley RA: Neuropsychological testing is not useful in the diagnosis of ADHD: stop it (or prove it)!. ADHD Rep 2019; 27:1–8; doi:10.1521/adhd.2019.27.2.1
67. Moffitt TE, Houts R, Asherson P, et al: Is adult ADHD a childhood-onset neurodevelopmental disorder? Evidence from a four-decade longitudinal cohort study. Am J Psychiatry 2015; 172:967–977;doi:10.1176/appi.ajp.2015.14101266
68. Shaw M, Hodgkins P, Caci H, et al: A systematic review and analysis of long-term outcomes in attention deficit hyperactivity disorder: effects of treatment and non-treatment. BMC Med 2012; 10:99;doi:10.1186/1741-7015-10-99
69. Chandra S, Biederman J, Faraone S V: Assessing the validity of the age at onset criterion for diagnosing ADHD in DSM-5. J Atten Disord 2016:108705471662971;doi:10.1177/1087054716629717